

who write upon the progress of plant life on the globe, I take the liberty of reporting briefly what we really know in regard to the cretaceous flora of the North American continent.

Some twenty years ago numerous impressions of angiospermous leaves were brought by Dr. Hayden and myself from the group of sandstones which lie at the base of our cretaceous system. Outline sketches of a part of these were sent by Mr. Meek to Prof. Heer, of Zurich. He pronounced them miocene tertiary. To this conclusion he was led by their high botanical rank, their generic affinities with miocene plants, and the supposed identity of some of them with miocene species.

The announcement of Prof. Heer's decision led to a somewhat earnest discussion, in which Prof. Heer, M. J. Marcon, and Mr. Leo Lesquereux supported the view that the plants in question were tertiary, while Messrs. Meek and myself asserted that they were cretaceous, because the strata which contain them are overlain by more than 2,000 feet of limestones filled with characteristic cretaceous fossils, a number of which are identical with those found in the gault and chalk of Europe. An end was finally put to this debate by M. Marcou and Prof. Capellini, of Bologna, going to Kansas and collecting a large number of these leaves from beds overlain by unmistakable cretaceous strata. The true position of this flora was then not only acknowledged but proclaimed by these gentlemen, and since that time every geologist in America has accepted the statement which I made in my letter to Messrs. Meek and Hayden in 1858, and in my article on the Ancient Vegetation of North America (*American Journal of Science*, vol. xxix, 1860, p. 208), that "the American flora assumed nearly the botanical character it now has in the cretaceous age, and that our lower cretaceous rocks contain the remains of sixty or seventy species of angiospermous trees, many of which belong to our most common living genera, such as *Quercus*, *Salix*, *Magnolia*, *Platanus*, *Liriodendron*, *Fagus*, *Alnus*, *Liquidambar*, &c."

Since the settlement of this question a large number of additions have been made to the then known species of this flora, and it is probably not too much to say that we have obtained leaves of nearly one hundred species of angiospermous trees from the base of our cretaceous system, the equivalent of the upper greensand of England.

All the leaves figured in Lesquereux's "Fossil Flora of the Western Territories," part I., were obtained from this horizon, and a large number of additional species have been described by Prof. Heer in his "Phyllites Cretacea," or by myself in "Our Later Extinct Floras," while many others yet wait publication.

The plants of our upper cretaceous and tertiary rocks have not yet been fully described, and there is some difference of opinion as to where the line should be drawn between these two systems, but it is quite certain that a large part of the species described by Mr. Lesquereux from the "lignite beds," and referred by him to the tertiary, are really cretaceous; not only because they are associated with *Ammonites*, *Inoceramus*, and other cretaceous fossils, but because the strata which contain them underlie unconformably the *Coryphodon* beds, the base of our eocene. Whatever shall be ultimately decided in regard to the line of separation between our later cretaceous and earlier tertiary strata, this will in no wise affect our conclusions in regard to the general facies of the American cretaceous flora. The statements made many years since are confirmed by all fresh evidence, and now stand unquestionable, that between the trias and the chalk—we know nothing of our Jurassic flora—the vegetation of North America was revolutionised, and that at the beginning of our cretaceous age it had assumed essentially the character and consisted chiefly of the same generic elements that it exhibits now.

I may also add that up to the present time no species of *Ammonites*, *Baculites*, or *Inoceramus* have yet been found in America above the cretaceous system; and that so far as we now know, these genera are as decisive of the age of the strata which contain them here as in the Old World. J. S. NEWBERRY

Columbia College, New York, June 19

#### Meteorological Notes from Lisbon

THE following meteorological notes, compiled in great part from the daily bulletins of the Observatorio Real of Lisbon, supplemented by observations made by myself, by means of a Casella's self-registering thermometer and a good aneroid barometer, during a seven months' residence in that city, may not be without some value to weather observers. I arrived on

October 15, consequently the observations for this month refer only to the latter half. The records were made at 9 A.M. and at 5 P.M. To save space the readings will be given throughout (except for October) in the following order:—I. Barometer (reduced to sea-level), (a) the average of observations taken at 9 A.M., (b) the highest, and (c) the lowest reading of the month. II. Thermometer (Fahrenheit), (a) average of daily observations made at 9 A.M., (b) average of the highest, and (c) of the lowest readings in the twenty-four hours; (d) the highest, and (e) the lowest reading of the month. III. Direction of Wind: N. S. E. W. represent the directions indicated, or any point thereof, after which the number of days is given on which it blew from that quarter. IV. The rain of the month is stated in inches.

OCTOBER, 1876.—The morning temperatures ranged from 54° F. to 70°; midday, from 62° to 80°; and evening, 53° to 72°; the average of the night temperature for the half-month, 52°; and the average rainfall for the same period was 3·8 inches. No wind record was kept.

NOVEMBER, 1876.—I. (a) 29·95, (b) 30·44, (c) 29·44. This last reading is the record of the 12th, and was accompanied by a terrific gale from the south-west, which wrought much damage both on land, on the river, and at sea. Several residents, who were not unfamiliar with earthquake shocks, averred that they felt a distinct tremor of the earth about 4 A.M., at which time the barometer registered 29 inches. In the Bay of Biscay on the same morning the lowest point reached by the mercury was 28·25, as I was, I believe accurately, informed by the captain of a Glasgow steamer which arrived in the Tagus some days later. II. (a) 57°·59, (b) 63°·9, (c) 54°·09, (d) 70°·98, (e) 46°. III. N. 7 days, S. 10, E. 7, W. 2; of 3 days no record. IV. Rain, 10 inches, which fell on 17 days. This was one of the most rainy Novembers for many years. The rainfall of the year 1874 was 17·2, and that of 1875, 18·3 inches. The total amounts for the months of November from 1873–1875 was 5·5 inches. The mean of this month for the last twenty years is 4·3 inches. Most destructive floods occurred during the month.

DECEMBER, 1876.—I. (a) 29·96, (b) 30·3, (c) 29·4 inches. II. (a) 54°·8, (b) 59°·5, (c) 51°·6, (d) 65°·5, (e) 44°·2. III. N. 5, S. 18, E. 0, W. 5, calm 3 days. IV. Rain 19·19 inches on 28 days, greatest fall on 1 day (6th) 3·2 inches, and least '003.

JANUARY, 1877.—I. (a) 30·18, (b) 30·58, (c) 29·54 inches. II. (a) 52°·93, (b) 58°·96, (c) 50°·8, (d) 65°·66, (e) 44°. III. N. 17, S. 9, E. 0, W. 3, calm 2 days. IV. Rain which fell on 14 days, 7·007 inches; from 1st to 10th, 6·669 inches.

FEBRUARY, 1877.—I. (a) 30·35, (b) 30·54, (c) 29·92 inches. II. (a) 52°, (b) 56°·64, (c) 48°·29, (d) 67°·38, (e) 42°·9 (the lowest temperature of the seven months). III. N. 25, S. 1, E. 1, W. 0, calm 1 day. IV. Rain, which fell on 2 days, 1·28 inches.

MARCH, 1877.—I. (a) 29·94, (b) 30·39, (c) 29·36 inches. II. (a) 47°·63, (b) 59°·34, (c) 48°·5, (d) 71°·0, (e) 43°·3. III. N. 10, S. 9, E. 1, W. 6, calm 1, of 4 days no record. IV. Rain, which fell on 13 days, 2·5 inches.

APRIL, 1877.—I. (a) 29·92, (b) 30·13, (c) 29·60 inches. II. (a) 65°·5, (b) 62°·9, (c) 51°·9, (d) 71°·7, (e) 48°·2. III. N. 8, S. 8, E. 1, W. 11, 2 days unrecorded. IV. Rain in 17 days, 6·5.

I would draw the attention of those threatened with bronchial or pulmonary complaints to this locality as a winter and spring refuge. The site of the city of Lisbon is finely chosen, facing almost due south, and the position of the principal part of the town in which the chief hotels are, is nearly sheltered from the northerly and easterly winds by surrounding heights. It is of easy access from England—3½ days, and sometimes fewer, from Southampton by a royal mail steamer. Fires are rarely to be seen in a Portuguese sitting-room, and during the seven months of my sojourn there it was necessary only once or twice to have one in our room for an invalid's sake. I had an opportunity of seeing many sufferers both *en route* for, and again returning to England from, Madeira. Some of them complained much of the weather experienced there, and said how they wished they had remained in Lisbon, where the climate seemed equally to suit them, and where they should have had at least more comforts, more cheerful society, and more varied means for killing the Enemy—time. HENRY O. FORBES

#### Fertilisation of Flowers by Insects

In my last article on Alpine Gentiana species, I supposed that the chief, if not the only fertiliser of *G. bavarica* and *varia* might be *Macroglossa stellatarum* with its proboscis of 25·28 mm.

length. Yesterday, near the Albula pass, I was happy enough to confirm this supposition by direct observation. Altogether I saw five specimens of *Macroglossa stellatarum* at work, one on *Gentiana bavarica* and *verna*, three on *Primula integrifolia*, and one on *Viola calcarata*, each of them in a few minutes fertilising some hundreds of flowers. For instance, the last of my five *Macroglossa* specimens, which I observed with the watch in my hand, in less than four minutes visited 108, and in other 6½ minutes 194 flowers of *V. calcarata*.

As an illustration to what I have said in a former article on alpine orchids generally being adapted to cross-fertilisation by Lepidoptera, I may mention that near my present domicile there grow nine species of orchids, eight of which (*Nigritella angustifolia*, *Platanthera bifolia*, *Grymnadenia conopsea*, *odoratissima*, *albida*, *Habenaria viridis*, *Orchis globosa*, and *ustulata*) are adapted to cross-fertilisation by Lepidoptera, whilst only a single one (*Orchis latifolia*) is adapted to cross-fertilisation by other insects.

HERMANN MÜLLER

Wissenstein, Albula Valley, Switzerland, July 23

#### Local Museums

I HAVE read with very great interest both the letters and articles which have lately appeared in NATURE on the subject of local museums. The suggestions offered by your various correspondents are in every way admirable, and my only excuse for adding my own name to the number is because I think that although a great deal has been said on the matter next to nothing has actually been done. If local museums are to be established amongst us as a means of promoting advancement in education the sooner the matter is taken in hand by those most competent to deal with it the better.

What I would strongly advocate is that a society be formed in London for the promotion of local museums. If Prof. Boyd Dawkins, and any others possessing the requisite attainments for taking the matter in hand, would form an association of this kind, I, for one, and doubtless many others of your readers, would gladly subscribe and co-operate for the realisation of the scheme.

J. ROMILLY ALLEN

34, James Street, S.W.

#### Proposed New Museum

Now that the new Natural History Museum is approaching completion, will you allow me to call attention to a need which has probably been felt by others beside myself, and which we may hope will be met in the new institution? This is a museum or collection of varieties of plants and animals produced by domestication. I need not enlarge upon the value of such a collection to the student of biology. The revolution in the philosophy of biology created by Mr. Darwin was founded upon an examination of such varieties, and I have small doubt that my plea will be seconded by botanists and zoologists who will speak with much greater authority than I can.

I base my own request upon another ground, and one which touches very closely the science I am chiefly conversant with, namely, ethnology. Rutimeyer in Switzerland, Busk, Dawkins, and others in England, Brandt in Russia, and others elsewhere, have shown how invaluable the evidence furnished by varieties of domestic animals is for elucidating the earlier history of our race. Yet there is no collection known to me anywhere except the one made by Mr. Darwin himself, illustrating the subject, and if one wishes to examine the various breed of cattle, sheep, dogs, or pigs, of vegetables and fruits, &c., which have become localised in various parts of the world, as the companions of man, one is entirely at a loss for materials in an accessible form.

May we hope that the very efficient staff of the National Museum will see their way to setting apart one room at least in which the variation of animals and plants under domestication may be shown, and the glorious discoveries of the greatest biologist of modern times may be fitly illustrated in the National Museum of the country whose science he has so adorned.

HENRY H. HOWORTH

#### Adaptation of Plant Structure

I HAVE lately observed a curious adaptation of plant-structure which has not, to my knowledge, been recorded in books, and which may be interesting to your botanical readers.

There is in the Himalayas an *Arum* bearing a remarkable resemblance to a cobra with its hood raised, which is well

known to natives and many Europeans by the name of the "cobra plant." Standing immediately behind and above the spathe is a large ternate leaf, the two lower leaflets of which, at an early stage of growth, enfold the spathe and spadix, and subsequently stand in front of and partially conceal them from view. When, however, the anthers or the stigmas, as the case may be (for the plant is dioecious), are mature, the lower halves of these lateral leaflets fold close up over their upper halves, thus leaving the whole of the spathe conspicuously exposed to the notice of passing insects. I inclose a rough sketch made from a living plant. It will be observed that if the lateral leaflets were extended they would conceal the flower from insects flying at a higher level than the mouth of the spathe. It is therefore an advantage to the plant that they should assume this abnormal position.

I may add that the resemblance of this *Arum* to the cobra snake is very close, and cannot easily be accounted for. The diamond-shaped markings of the cobra's head are counterfeited on the spathe, as also are the lines on the neck; while the tongue-like prolongation of the spadix and of the mid-rib of the spathe serve to complete the resemblance of the plant to a living animal. As the cobra is almost unknown in the localities where this *Arum* grows, it seems that the strange mimicry can be nothing more than accidental coincidence, even if any theory of advantage to the plant therefrom could be devised. But the "counterfeit presentment" is so striking that I am convinced any person who unexpectedly saw this plant "rearing its horrid head" above the rank herbage of an Indian jungle would start back with horror.

HENRY COLLETT

Nagkunda, near Simla, June 15

#### Rattle-snakes in Wet Weather

I HAVE had much pleasure in reading Mr. Frank Buckland's edition of "White's Selborne." Among the notes on page 448, Mr. Buckland says:—"I know that rattle-snakes cannot play up their rattles in wet weather. The horn of the rattle becomes more or less saturated with water, and no sound can then be produced from it. By placing a rattle in a glass of water, and letting it soak a while, I find this is the case."

Mr. Buckland's dried rattle has led him into an error. The live rattle-snake can "play up" his rattle in the very wettest of wet weather. I have taken them alive on two occasions in the midst of a heavy rain, and I could discover no difference in their rattling powers. It is true, however, that rattle-snakes are seldom found in low moist places; they frequent, by preference, high and dry ground.

During the year 1873 I kept in my room a rattle-snake for eight months. In this time I came to know that "Rattler," so I called him, could "play up" several different notes indicative of anger, of pleasure, and of loneliness.

I think that it will be found, upon proper examination, that the fangs of the rattle-snake are shed just as the teeth of other animals.

HUNTER NICHOLSON

East Tenn. University, Knoxville, Tenn., U.S.A.

#### Meteors

AT 9.48 last evening I saw a bright meteor pass downwards towards a Aquarius, where it disappeared. It emitted a bluish light, and although the moon was up, it shone for a few seconds with the brilliancy of Venus. A second smaller meteor passed upwards towards the zenith about 10.5. In both cases the vanishing point was near Delphinus.

W. AINSLIE HOLLIS

Brighton, July 30

#### OUR ASTRONOMICAL COLUMN

THE HERSCHELIAN COMPANION OF ALDEBARAN.—In a communication lately received from M. Camille Flammarion, it is endeavoured to show that the change of relative situation of the small star with respect to Aldebaran, is not accounted for by the proper motion of the latter, as was stated by Struve ("Positiones Medie," p. ccxxvi.), but that it is necessary to admit the existence of a very appreciable proper motion of the companion, which would be the first instance of the kind in so small a star. M. Flammarion collects the various published measures and adds to them measures made by Mr. Gled-